RS-Global system

GSM/GPRS/SMS/GPS object module

Programming manual

2005

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General information

GSM/GPRS/SMS/GPS object module is a device, which is mounted on a vehicle for distant control of its systems and for locating vehicle's position. Object's location (geographical coordinates) is determined with the help of **GPS** (Global Positioning System). This information, along with information about controlled systems and object's parameters status transmits to user through **GSM** web on demand, or using built in algorithm.

If **GSM** web operator provides data transmitting through **GPRS**, than object movement control is realized in «online» mode, that means, that information about object coordinates is transmitted not on demand, but right after their change on adjusted value.

Device features

- 12-channel GPS-receiver with NMEA-0183 protocol;
- Writing in non-volatile memory 1950 (3900) route points and 185 (375) events.
- RS-232 port for reading GPS-information, route, event log, and for programming block parameters.
- GPS-receiver and GSM-modem status indication ▪Ignition control input
- Input for alarm signal connection ▪Input for panic button connection
- Input for status signal connection (armed/disarmed) ▪Input for on-board power control
- Input for analogue signal (ADC) control ▪Alarm activation output
- Engine blocking output ▪General purpose output
- Adjusted speed exceeding control ▪Leaving adjusted zone control ▪Up to 4 user support
- Two on-the-fly switchable message modes: «text» and «modem» ▪Tracking mode
- «Online» mode
- Periodic channel test possibility: from 1 hour to 10 days

Device technical characteristics.

|	
Number of GPS-receiver channels	12
GPS-receiver output protocol	NMEA-0183
GSM-protocol	E-GSM 900/1800
GSM-modem	Wavecom Wismo
SIM interface	3B
Number of users	4
Output capability	1A
Maximum voltage on closed output	40V
Maximum voltage on inputs	40V
Measured ADC value range	0 – 4V
Supply voltage *	9 – 18 V
Input current (at 12V power supply), at most	90mA
Overall dimensions	145x97x24

* When using standby power supply, voltage range from 9 to 36V.

Module appearance
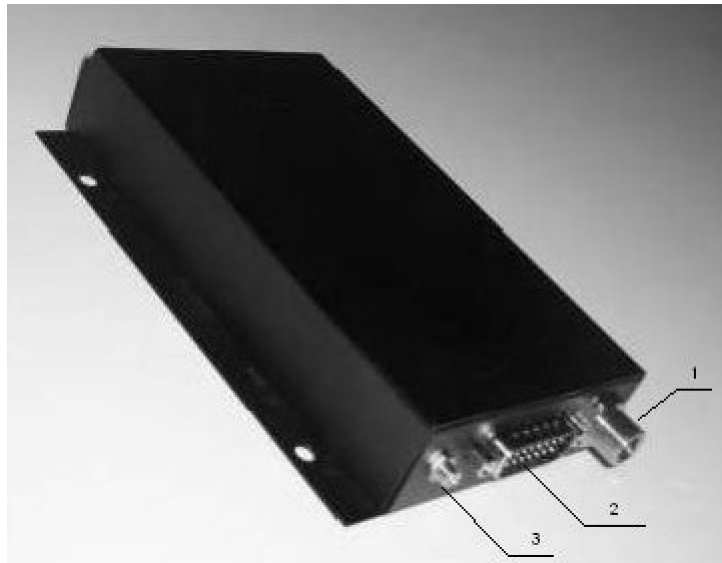
Pic. 1 GPS-GSM module.

1.GSM antenna connection joint (FME).
2.Peripheral device connection joint (DB-
15M). 3.GPS antenna connection joint (MCX).
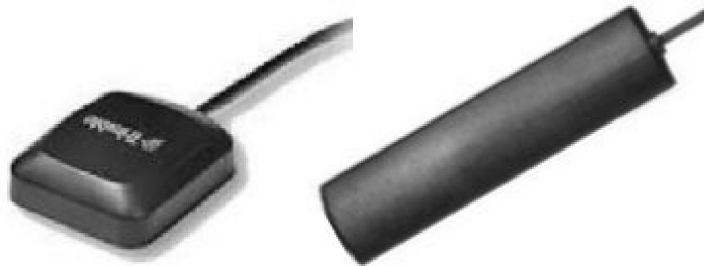
Pic. 2 GPS and GSM antennas.

Preparing for programming.

Module programming is made with the help of the special program **GPSReader** through computer COM-port.

Before programming module must be prepared for work i.e. SIM-card must be inserted, and at least one user («master») must be registered - see module manual p.5 «module basic setting».

After that module is connected to computer COM-port and connected to power supply. GSM antenna must be connected to module, it isn't necessary to connect GPS antenna. After connecting power supply, module indicator must flash green and after successful load of SIM-card parameters green indicator should start to blink. If it doesn't, it's necessary to make sure that SIM-card is inserted into the block and it's PIN-code – 0000.

When block is ready for work, **READY** message (98 – in «modem» mode) is send to all registered users. At this time indicator starts to blink red (if GPS antenna is connected and coordinate determination is possible), or flashes red (if it's impossible to determine coordinates).

To initiate module programming mode it's necessary to send him from «master's» phone command **8.xxxx**, where xxxx – module PIN-code (by default – 1234). As an answer module sends message **PRG MODE** (97). After that green light is turned off and module is ready for programming.

Note. Programming must be initiated in 2 minutes, or module will return in work mode.

GPSReader program: general information

GPSReader program is designed for module parameters programming, configuration of user rights and message sending addresses, GPS receiver working control, downloading route and event log from module memory and sending it to server. Program's main window appearance is shown on Pic.1.
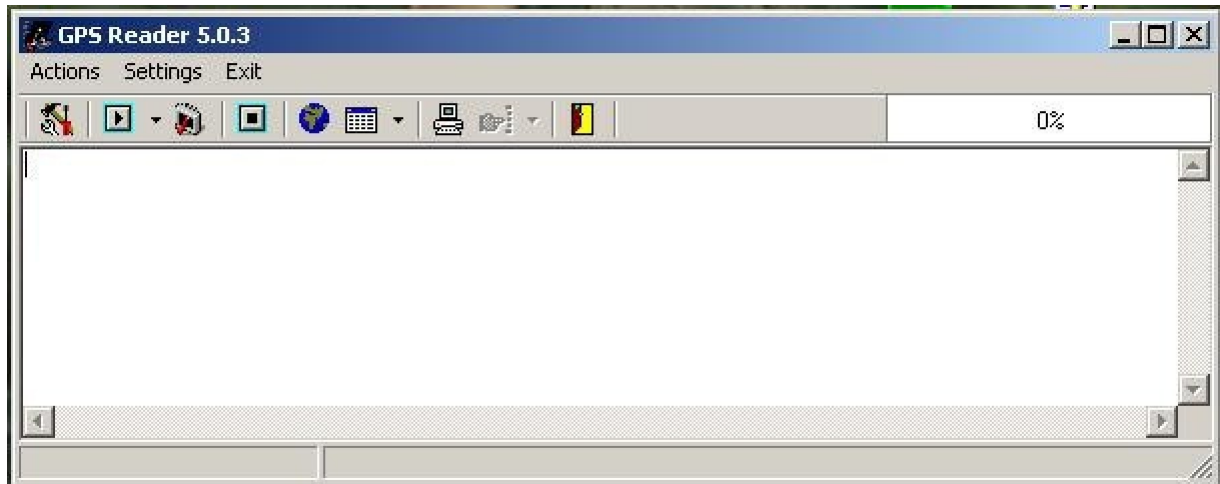
Pic. 1 Program main window.

All program's function and setting start is made through main menu and duplicated by icons, located at the top of the window (see Pic.1.)

GPSReader program: settings

Program settings are settings of computer serial port for connection with module and adjusting parameters of the server, on witch module information should be sent. Parameter adjusting window can be opened either through main menu (Settings), or by 🛠 icon.
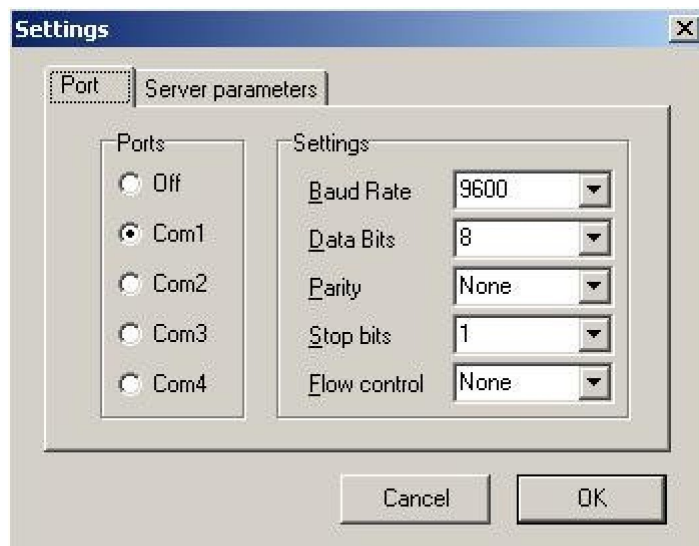
Pic. 2 Port settings window.

In Ports column should be chosen number of computer serial port, through witch communication with module would be realized. In "Settings" column - this port parameters. For work with described module port parameters should be like ones on the Pic.3.
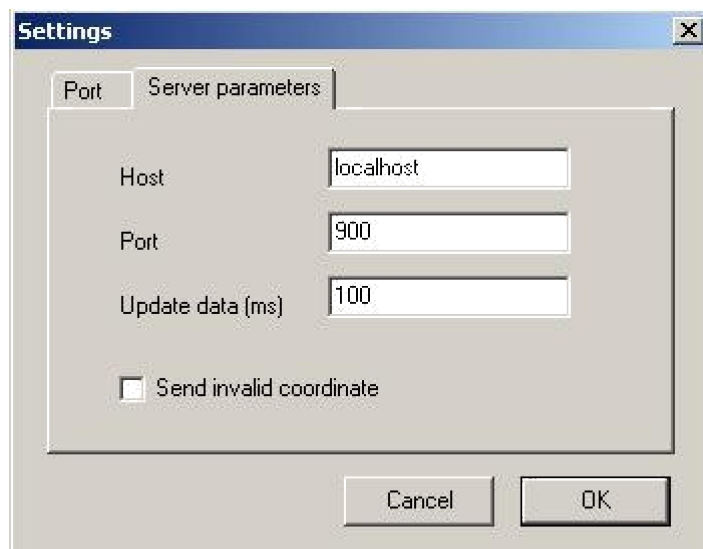
Pic. 3 Server parameters adjusting window.

In this window are shown server parameters «Tracking» software, on which can be send information about route, downloaded from the module through port (see paragraph «Data reading»).

In the **Host** field are specified name or IP-address of the computer, which has installed Tracking Server (localhost – when Tracking Server is installed on the same computer with GPSReader).

In the **Port** field are specified number of the port which is used by server to receive data. By default – 900.

In the **Update data (ms)** field are specified delay in sending information lines on server. It is recommended to increase when connection with server quality is low.

Send invalid coordinate checkbox is recommended to leave unfilled, because otherwise server will accept messages with invalid coordinates that can cause errors in program functioning.

GPSReader program: data reading

With the help of the program it is possible to read information from the module through serial port for it's handling and/or sending to server. This reading method is used if module doesn't support reading through GPRS mode, or data transmitting through GPRS is not supported by mobile communication operator on the current territory.

Just like through GPRS connection, through serial port from the block can be read two data types: route (1950 or 3900 points) and event log (185 or 370 entries). Reading initialization is realized either though main menu (Action / Route download or Action / Log download) or with icon.

Note. Before data reading initialization module must be switched in programming mode (see paragraph «Preparing for programming»).

Information that is downloaded from the module is placed in user specified text file.

With (Stop) icon you can interrupt data reading process.

GPSReader program: data upload

After reading route information, it's necessary to send them to server, so route could be displayed in Tracking View program. For this exists data upload function. For it's initialization is necessary to activate Action/Data upload command in main menu (or   icon), and than choose file which contains route information and start upload.

Note. For successful data upload server parameters should be specified in program settings.

GPSReader program: module parameter programming

Module parameter programming is initiated by the main menu command **Action/General setting** or icon. Current parameters are read and displayed in programming window that is shown on Pic.4.

Pic. 4 Module parameter programming window.

After setting necessary module parameters press **OK** button**.** In that case renewed module parameters will be written into module. To save parameters into file press **Save** and specify file name and save route. To load previously saved parameters press **Load** and specify the file from which parameters will be loaded. **Load** and **Save** parameters are available only if parameter window is active (i.e. before **OK** button is pressed).

Some parameters can be edited in user mode, some - only in installer mode, and some are informational and cannot be edited. Parameter descriptions are given in **Table 1**.

Before initialization of **General setting** program module must be switched in programming mode (see paragraph «Preparing for programming»).

If it's impossible to connect to module, error window will appear (Pic.5.).

If that happened, check if the cable works properly, module connection to computer validity and port settings (see paragraph «Settings»).

Pic. 5 Connection error window

Program has preliminary parameter setting mode. In that mode you cam set necessary module parameters without connecting module to the computer, save them to file, and than load them to module when it will be accessible for programming. To enter this mode you must choose **General setting** command when module is not connected and press **OK** in connection error window (Pic.5.).

In that case parameter programming window will open with zero data. After entering necessary parameter value press **Save** and specify file name and save route.

Later, when module will be connected, you can load parameters from that file, and write them into module.

Table 1. Module general parameters.

Parameter	Value by default	Description	Editing	
			User	Inst.
WDT_Timer	15 min.	Determines the time, during which GPS receiver can work without receiving certain coordinates. After time expiration, receiver restarts and sends message that coordinates is lost.	Yes	Yes
Query time	3 sec.	GPS-receiver query time with the purpose to gain information about current coordinates.	Yes	Yes
Zones response time	500 msec.	Input response time on the status change.	No	Yes
Speed for block	46.3 km/h	Maximum vehicle speed value, at which engine blocking takes place[1]	No	Yes
Latitude dead zone	5.0	Latitude shifting value (in geographical seconds), exceeding which, route entry is made into memory, and current coordinate is transmitted in «online» mode.[2]	Yes	Yes
Longitude dead zone	5.0	Longitude shifting value (in geographical seconds), exceeding which, route entry is made into memory, and current coordinate is transmitted in «online» mode.[3]	Yes	Yes
Speed over value	Not specified	Speed value, exceeding which, message with information about current speed value is transmitted.	Yes	Yes
Test time value	24 h	Module test message period.	Yes	Yes
Bat low const.	155 c.u.	Value (in conventional units) of the module power supply voltage. When lower – low voltage message is send.	No	Yes
Bat norm const.	175 c.u.	Value (in conventional units) of the module power supply voltage. When higher – module power supply is considered restored.	No	Yes
Txt format	0F	Flags, that determine message transmitting mode («text» or «modem») according to users.	No	Yes
Module PIN	1234	Module PIN-code that is used for it's identification. Also can be changed by SMS	Yes	Yes
SIM PIN	0000	SIM-card PIN-code. Used for locking module on specific SIM-card. By default – 0000	Yes	Yes
User for call	--------	Not used in this version		
Time zone	3	Time zone, which module is used in.	Yes	Yes
Firmware ver		Module software version. If set on 0, module uses factory presets.	Yes	*Yes*
Query time in online	10 sec	Connection with server test period in «online» mode[4]	No	*Yes*
Attempts for activating GPRS	2	Number of attempts to establish GPRS connection.	No	*Yes*

Parameter	Value by default	Description	Editing	
			User	Inst.
Reconnect time for online	3 min	Time interval between attempts of module to connect to server.	No	*Yes*
Attempts for reconnect online	3	Number of attempts to establish connection with server.	No	*Yes*
APN		APN for logging on when GPRS connection is established. Information is provided by mobile operator.	Yes	*Yes*
SIM ID		SIM-card identificator. [5]	No	*No*
TCP port	920	Computer port, which is used to connect to server.	Yes	*Yes*
Server IP		Server IP address.	Yes	*Yes*
Tlf number		Module phone number (written down at authorization)[5]	No	No

Notes.

Parameters that written in italic is related to module that has opportunity to use GPRS channel:

1. *Speed for block* – Maximum vehicle speed value, at which engine blocking takes place. If when command received, speed exceeds given value, module waiting for speed decrease, and then blocks the engine.

2. *Latitude dead zone* – Shifting converting from geographical coordinates Lt (in seconds) into distance S (in meters) is made using formula: $S = (Le* \pi/Gr)*Lt = 30,8*Lt$, where Le=12714000m – Earth circumference, Gr=1296000 – number of seconds in circuit.

3. *Longitude dead zone* – Shifting converting from geographical coordinates Lg (in seconds) into distance S (in meters) is made using formula: $S = ((Le*\pi/Gr)*Lg)*Cos(Lt) = 30,9*Lg*Cos(Ltt)$, where Le= 12756000m – Earth circumference, Gr=1296000 – number of seconds in circuit, Lt – point geographical latitude. For Riga latitude, formula will be: $S = 16.8*Lg$.

4. *Query time in online* – server query time by module. The more this period, the less will be summary traffic, but the longer message delivery to module.

5. *SIM ID and Tlf number* – those parameters are informational, cannot be edited and can be seen only after successful module authorization (see User manual).

GPSReader program: programming user rights.

Programming of user rights is initiated by main menu command **Action/Config for COMMAND** or by icon. At this time current module configurations read from module and opens programming window (Pic.6.)

Before **Config for COMMAND** command initialization module should be switched into programming mode (see paragraph «Preparing for programming»).

If it's impossible to connect to module, error window will appear (Pic.5.). If that happened, check if the cable works properly, module connection to computer validity and port settings (see paragraph «Settings»).

As you can see on the left side there are a list of commands supported by module, and in columns to the right you can allow (✓) or forbid ( ) given command to proper user (**U1 – U4**), and also allow or forbid module command acknowledgement transmitting (**Replay**).

Available command description is given in **Table 2**.

When done configuring module press **OK.** In that case renewed parameters will be written into module. To save module configuration into file press **Save** and specify file name and save route. To load previously saved configuration press **Load** and specify he file from which configuration will be loaded. **Load** and **Save** parameters are available only if parameter window is active (i.e. before **OK** button is pressed).

Рис. 5 User rights configuration window

Program has preliminary parameter setting mode. In that mode you cam set necessary module parameters without connecting module to the computer, save them to file, and than load them to module when it will be accessible for programming. To enter this mode you must choose **Config for COMMAND** command when module is not connected and press **OK.**

In that case parameter programming window will open with zero data. After setting necessary configuration press **Save** and specify file name and save route.

Later, when module will be connected, you can load configuration from that file, and write it into module.

Table 2. Commands supported by module

Command	Command description	Note
Switching mode	Allows switching message mode between «modem» and «user». In the first case messages are transmitted in text form, in the second – codes with current coordinates.	Recommended to allow to all users.
Check status	Allows to request module status (it's input and output status)	
Set ALARM	Allows activating alarm on the object.	
Cancel ALARM	Allows deactivating alarm on the object.	
Set ALARM on time	Allows activating alarm on the object for indicated time.	
Activate OUT2	Allows to activate Output 2	
Deactivate OUT2	Allows to deactivate Output 2	
Activate OUT2 on time	Allows activating Output 2 for indicated time.	
Block engine	Allows to block the engine	
Unblock engine	Allows to unblock the engine	
Start tracking	Allows to turn on object tracking mode with given time interval (through SMS)	User who receives information is assigned separately.
Stop tracking	Allows turning off object tracking mode.	

Command	Command description	Note
Check coordinate	Allows to request object coordinates	
Check ADC	Allows to request module analogue input status (ADC value)	
Set normal state	Allows to set module current status as normal (armed, inputs and outputs normal)	Used at module start installation
Set speed limit	Allows to set speed value, exceeding which message is send.	Used for adjusted speed exceeding control.
Set shift limit	Allows to set latitude and longitude shifting value, exceeding witch message is send.	
Program mode	Allows switching module in programming mode.	Recommended only for «master»
Show User1	Allows to request number of the first user (master).	Recommended only for «master»
Show User2	Allows to request number of the second user	
Show User3	Allows to request number of the third user	
Show User4	Allows to request number of the fourth user	
Erase User2	Allows to delete number of the second user	
Erase User3	Allows to delete number of the third user	
Erase User4	Allows to delete number of the fourth user	
Change/Set User1	Allows to set or change number of the first user	Only for «master»!
Change/Set User2	Allows to set or change number of the second user	
Change/Set User3	Allows to set or change number of the third user	
Change/Set User4	Allows to set or change number of the fourth user	
Module config	Allows realizing module parameter adjustment through SMS.	Only for «master»!
Change module PIN	Allows to change module PIN-code	Recommended only for «master»
Get route	Allows to download route from module memory	Only for «master»!
Get log	Allows to download log from module memory	Only for «master»!
Work online (GPRS)	Allows to switch module in «online» mode	Only for «master»!
Work offline (GPRS)	Allows to switch module in «offline» mode	Only for «master»!

GPSReader program: message sending programming.

User rights programming is initiated from main menu **Action/Config for EVENT** or with
 Config for EVENT icon. At this time current module configuration read from module and opens
programming window (Pic.7)
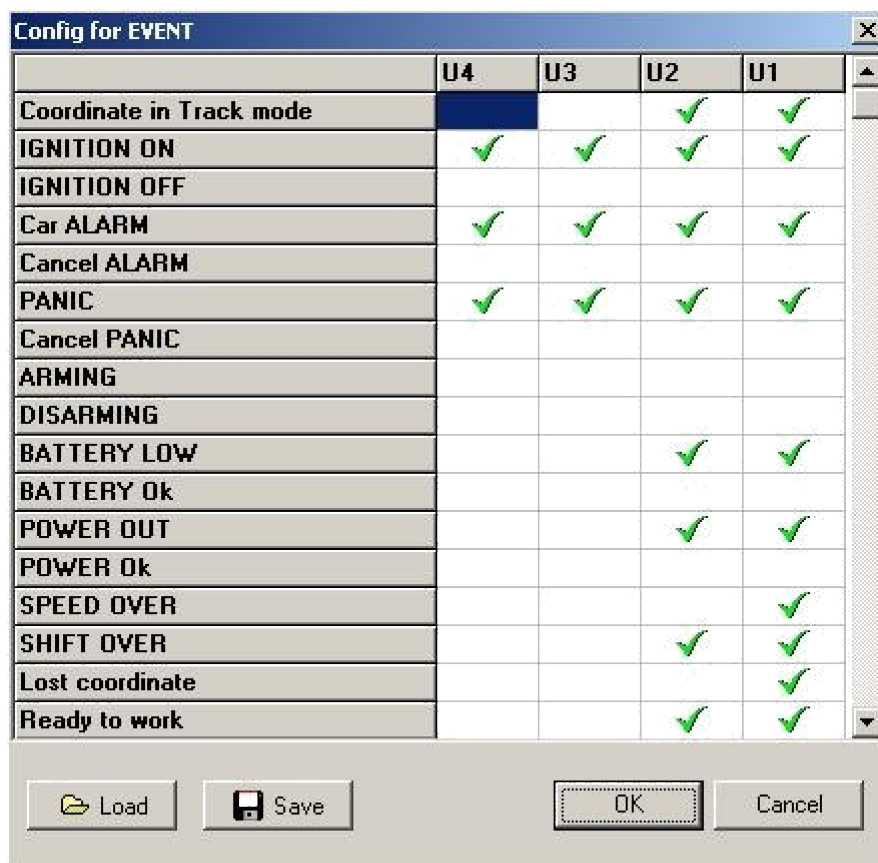
Pic. 6 Message sending programming window.

Before **Config for EVENT** command initialization module should be switched into programming mode (see paragraph «Preparing for programming»).

If it's impossible to connect to module, error window will appear (Pic.5.). If that happened, check if the cable works properly, module connection to computer validity and port settings (see paragraph «Settings»).

As you can see on the left side there are a list of events that appear in the module and assigned for sending, and in columns to the right you can allow (✓) or forbid ( ) given message sending to proper user (**U1 – U4**).

Description of events that can be send is given in **Table 3**.

When done configuring module press **OK.** In that case renewed parameters will be written into module. To save module configuration into file press **Save** and specify file name and save route. To load previously saved configuration press **Load** and specify he file from which configuration will be loaded. **Load** and **Save** parameters are available only if parameter window is active (i.e. before **OK** button is pressed).

Program has preliminary parameter setting mode. In that mode you cam set necessary module parameters without connecting module to the computer, save them to file, and than load them to module when it will be accessible for programming. To enter this mode you must choose **Config for EVENT** command when module is not connected and press **OK.**

In that case parameter programming window will open with zero data. After setting necessary configuration press **Save** and specify file name and save route.

Later, when module will be connected, you can load configuration from that file, and write it into module.

Table 3. Events

Event	Event description	Message	
		«user»	«modem»
Coordinate in Track mode	Current coordinate in tracking mode.		
IGNITION ON	Ignition on in «armed» mode. *		
IGNITION OFF	Ignition off (send only after IGNITION ON event).		

Event	Event description	Message	
		«user»	«modem»
Car ALARM	Signalization system activated.		
Cancel ALARM	Signalization system is switched in standby mode or turned off.		
PANIC	Alarm button pressed.		
Cancel PANIC	Alarm button released or unlocked.		
ARMING	Object switched in «armed» mode.		
DISARMING	Object switched in «disarmed» mode		
BATTERY LOW	Module power supply voltage is low		
BATTERY Ok	Module power supply voltage is restored to normal		
POWER OUT	Vehicle on-board power source is off (when using uninterruptible power supply).		
POWER Ok	Vehicle on-board power source is restored (when using uninterruptible power supply).)		
SPEED OVER	Maximum allowed speed is exceeded		
SHIFT OVER	Vehicle left adjusted zone		
Lost coordinate	Unable to determine certain coordinates during fixed time period		
Ready to work	Module is ready to work.		
Program mode entry	Module switched in programming mode.		
Test message	Periodic test message.		
Engine blocked	Vehicle engine blocked.		
GPRS error	Unable to establish GPRS connection		
Route: connection error	Connection with server error, when downloading route		
Log: connection error	Connection with server error, when downloading log		
Online: connection error	Connection with server error, when trying to go «online»		

GPSReader program: working with module GPS receiver

When in working mode, module transmits information in NMEA protocol on it's RS-232 port from GPS receiver port. This information can be used to check receiver status and vehicle navigation system organization.

Program allows displaying information from receiver in terminal mode, and sending on receiver some query-commands.

To switch program in terminal mode, you have to initiate main menu **Action/Terminal** command or press 🖳 icon.

If done so, in program terminal window are displayed certain NMEA protocol lines, and there is opportunity to call additional lines using following commands:
▪Ctrl+F1 – GGA line
▪Ctrl+F2 – GLL line
▪Ctrl+F3 – GSA line
▪Ctrl+F4 – GSV line

Module programming using SMS.

Starting from version 2.5., module supports parameter programming using SMS. This function is provided by **99.xx...xx** command, where **xx... xx** – parameter code and it's value. This command only available to the first user («master»). Available for programming parameter list and appropriate configurations is given in **Table 4**.

Table 4. Parameters, programmed using SMS

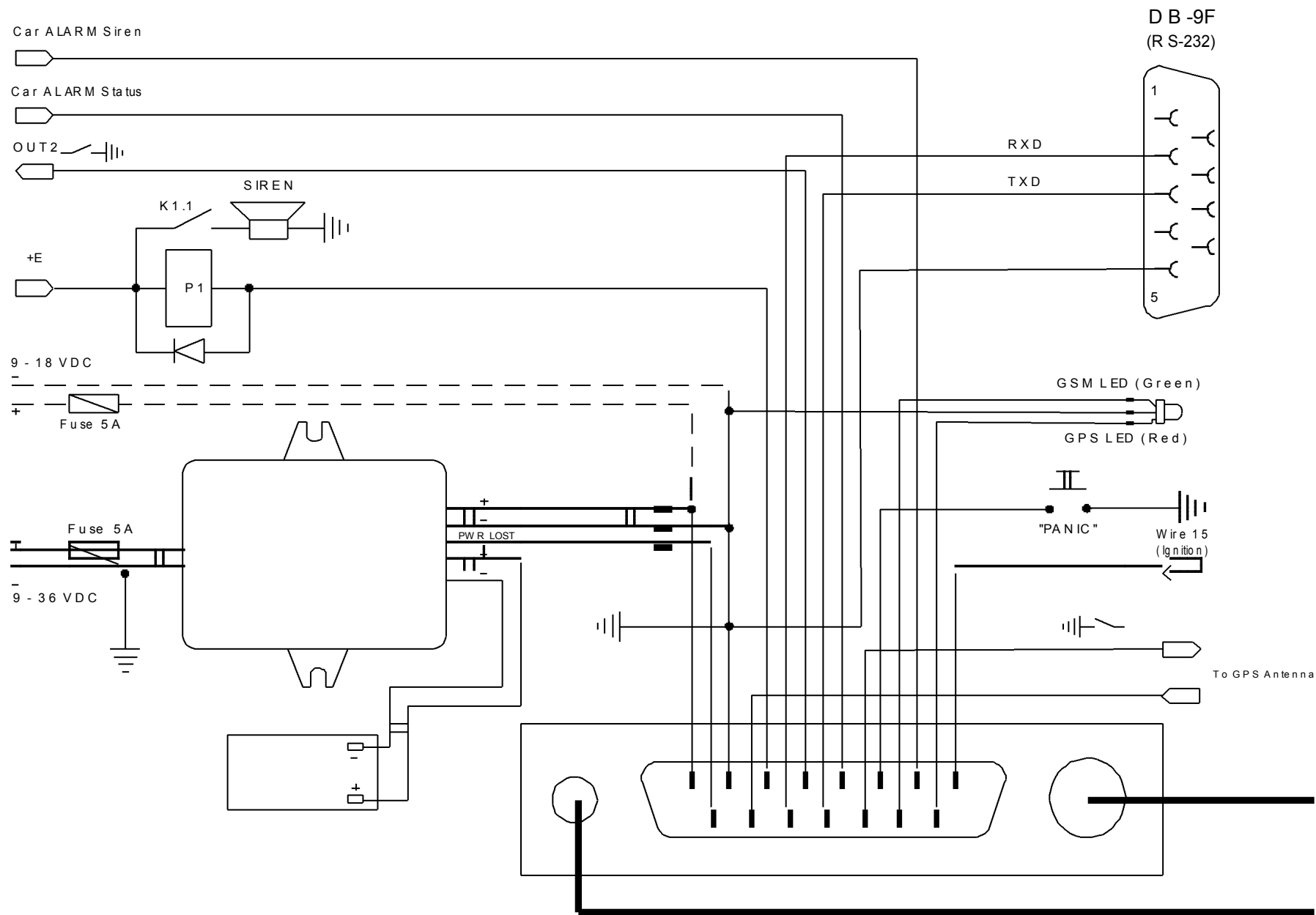| Command	Description	Way of sending	Example	By default
99.<hours>	Time zone[1]	SMS/GPRS	**99.**03	---
99.I<IP>	Server IP address	SMS	**99.I**211.21.211.2	---
99.A <access point>	APN	SMS	**99.A**internet.lmt.lv	---
99.P<port>	Server port	SMS	**99.P**920	---
99.D<Latitude, longitude(sec)>	Dead zone value	SMS/GPRS	**99.D**15,15 (Value from 1 to 3600 sec.)	5,5
99.T<hours>	Time between test sends	SMS/GPRS	**99.T**24 (from 1 to 255 hours)	24
99.R<tries>	Number of tries to restore connection with server	SMS/GPRS	**99.R**3 (from 1 to 255)	3
99.G<sec>	How often coordinates are requested	SMS/GPRS	**99.G**3 (from1 to 255 sec.)	3
99.O<sec->	How often server information is requested	SMS/GPRS	**99.O**10 (from1 to 255 sec .)	10
99.M<min>	Time between tries to restore connection with server	SMS/GPRS	**99.M**5 (from1 to 255 min.)	3
99.B<mode>	Engine blocking mode[2]	SMS/GPRS	**99.B**1 (from 1 to 4)	1
99.L1	Allow route «upload» (p. 8.6)	SMS/GPRS	**99.L1**	**allowed**
99.L0	Forbid route «upload» (p. 8.6)	SMS/GPRS	**99.L0**	
99.C1	Show net configuration	SMS	**99.C1**	
99.C2	Show time and engine blocking mode settings	SMS	**99.C2**	

Notes:

1)In «User» mode time of creation is added to message: for example, **14:37:11 READY (v.1.3)**. To receive time right, it's necessary to keep in mind time zone: for Latvia it's + 2 hours in winter period and + 3 hours in summer period.

> *Example:*
>
> 99.02, To display time correctly in winter period
>
> or 99.03 – for summer time

2)Engine blocking can be realized in 4 modesx:

> 1.Before engine blocking command **Set ALARM** command must be send and blocking signal is foreseen by the batch of one-second impulses.
> 2.Before engine blocking command **Set ALARM** command must be send, blocking signal is set immediately.
> 3.Blocking is made by one command, blocking signal is set immediately.
> 4.Blocking is made by one command, blocking signal is foreseen by the batch of one-second impulses.

Car ALARM Siren

Car ALARM Status

OUT2

SIREN

K1.1

+E

P1

9 - 18 VDC

Fuse 5A

9 - 36 VDC

Fuse 5A

PWR LOST

RXD

TXD

DB-9F
(RS-232)

1

5

Blockengine

Analog.IN (0

GSM LED (Green)

GPS LED (Red)

"PANIC"

Wire 15
(Ignition)

To GPS Antenna

Enclousure1.Modulewiringdiagram

Enclosure 2. Tracking View program command list

00	Current coordinate (in Tracking mode)
11	Tracking started
12	Tracking ended
13	Current coordinate
16	New maximum speed value is set
17	New shift control value set
18	Programming mode on
23	User 2 deleted
24	User 3 deleted
25	User 4 deleted
30	Module PIN-code changed
31	Ignition on
32	Alarm response
33	Panic button pressed
34	Disarmed
35	Power supply voltage low!
36	Adjusted speed exceeding
37	Leaving adjusted zone
38	Unable to determine coordinates
39	On-board power supply off!
40	Engine blocked!
50	GPRS connection establishes
51	GPRS connection lost
70	Data uploaded successfully
83	Module configuration changed
85	GPRS connection error
86	Server connection error (online)
87	Server connection error (route request)
88	Server connection error (log request)
89	Module successfully authorized
90	Module authorization error
94	Armed
95	Power supply OK
96	Test message
97	Module in programming mode
98	Module ready to work
99	On-board power supply attached